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DRAFT A

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Closure Plan for the 216-A-36B Crib

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

United States Department of Energy
P.O. Box 550
Richland, Washington 99352

Approved for Public Release;
Further Dissemination Unlimited

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TERMS

AEA	*Atomic Energy Act of 1954*
AFAN	ammonium fluoride and ammonium nitrate
ASD	ammonia scrubber distillate
bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CRW	cladding removal waste
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
MCL	maximum contaminant level
NA	not applicable
OU	operable unit
PUREX	Plutonium-Uranium Extraction Facility
RCRA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
RI Report	*Remedial Investigation Report for the 200-PW-2 Uranium-Rich Process Waste Group and 200-PW-4 General Process Condensate Group Operable Units*, DOE/RL-2004-25
RI/FS	remedial investigation / feasibility study
RI/FS Work Plan	*Uranium-Rich/General Process Condensate and Process Waste Group Operable Units RI/FS Work Plan and RCRA TSD Unit Sampling Plan; Includes 200-PW-2 and 200-PW-4 Operable Units*, DOE/RL-2000-60
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*, Ecology et al., 1989
TSD	treatment, storage, and/or disposal (unit)
WAC	*Washington Administrative Code*

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
If You Know	*Multiply By*	*To Get*	*If You Know*	*Multiply By*	*To Get*
Length			**Length**		
inches	25.4	Millimeters	millimeters	0.039	inches
inches	2.54	Centimeters	centimeters	0.394	inches
feet	0.305	Meters	meters	3.281	feet
yards	0.914	Meters	meters	1.094	yards
miles	1.609	Kilometers	kilometers	0.621	miles
Area			**Area**		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.0836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	Hectares	hectares	2.47	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	Grams	grams	0.035	ounces
pounds	0.454	Kilograms	kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
Volume			**Volume**		
teaspoons	5	Milliliters	milliliters	0.033	fluid ounces
tablespoons	15	Milliliters	liters	2.1	pints
fluid ounces	30	Milliliters	liters	1.057	quarts
cups	0.24	Liters	liters	0.264	gallons
pints	0.47	Liters	cubic meters	35.315	cubic feet
quarts	0.95	Liters	cubic meters	1.308	cubic yards
gallons	3.8	Liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			**Temperature**		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			**Radioactivity**		
picocuries	37	Millibecquerel	millibecquerel	0.027	picocuries

1.0 INTRODUCTION

This closure plan is being submitted in accordance with *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989a) milestones. Milestone M-020-00B requires submittal of a closure plan for the 216-A-36B Crib *Resource Conservation and Recovery Act of 1976* (RCRA) treatment, storage, and disposal (TSD) unit to the Washington State Department of Ecology (Ecology) by December 31, 2008. Interim milestone M-020-33 requires submittal of this closure plan to Ecology by April 30, 2006. A prior closure plan was submitted to Ecology for this TSD unit in 1988 (DOE, 1988, *Closure Plan, 216-A-36B Crib*,). This closure plan supersedes the 1988 submittal.

The 216-A-36B Crib is the south 152 m (500 ft) of the original 216-A-36 Crib. The original crib began operating in 1965 for the disposal of Plutonium-Uranium Extraction (PUREX) Plant ammonia scrubber distillate (ASD) waste to the soil column. In 1966, the 216-A-36 Crib was removed from service after six months of operation because of the rapid buildup of fission products within the first 30 m (100 ft) of the crib from what were then routine effluent releases. At that time, a vertical grout barrier was placed 30 m (100 ft) from the north end of the crib that isolated the heavily contaminated north end from the south end; the barrier subdivided the crib into the 216-A-36A (original) segment and the less contaminated 216-A-36B segment. The 216-A-36B Crib continued to receive ASD waste until waste receipt was terminated on September 6, 1987.

ASD waste was a mixed waste that, during the period of TSD operations, primarily was water containing ammonium hydroxide and small quantities of low-level radionuclides. Source, special nuclear, and by-product materials, as defined in the *Atomic Energy Act of 1954* (AEA), are regulated at U.S. Department of Energy (DOE) facilities exclusively by DOE, acting pursuant to its AEA authority. These materials are not subject to regulation by the State of Washington. All information contained herein and related to, or describing AEA-regulated materials and processes in any manner, may not be used to create conditions or other restrictions set forth in any permit, license, order, or any other enforceable instrument. DOE asserts that, pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and by-product materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

In August 1987, ASD waste was determined to be a dangerous waste under WAC 173-303, "Dangerous Waste Regulations," for the toxicity of ammonia (WT02, state-only toxic criteria). A RCRA Part A Form (Rev. 0), was submitted to Ecology in February 1988 (now located in DOE/RL-88-21, *Hanford Facility Dangerous Waste Part A Permit Application*), designating the crib as a landfill subject to RCRA regulations governing interim status TSD units. This unit operated as a TSD unit for less than one month (i.e., from August 19, 1987, the effective date of RCRA regulation of mixed waste, until September 6, 1987, when the unit received its final volume of waste). A RCRA interim status groundwater indicator parameter evaluation program is in operation at this site.

The 216-A-36B Crib was assigned to the process-based 200-PW-2 Uranium-Rich Process Waste Group Operable Unit (OU) for characterization and remedial decision-making. Although the

216-A-36B Crib is a RCRA TSD unit, the 216-A-36A and 216-A-36B Cribs are considered one waste management unit for purposes of future remedial action *under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) remedial investigation/feasibility study (RI/FS) process. Because of various similarities of process and waste, this waste group was consolidated with the 200-PW-4 OU for characterization. In fiscal years 2003 and 2004, TSD unit characterization data were collected in accordance with DOE/RL-2000-60, *Uranium-Rich/General Process Condensate and Process Waste Group Operable Units RI/FS Work Plan and RCRA TSD Unit Sampling Plan; Includes 200-PW-2 and 200-PW-4 Operable Units* (RI/FS Work Plan). Characterization data in support of closure are provided in DOE/RL-2004-25, *Remedial Investigation Report for the 200-PW-2 Uranium-Rich Process Waste Group and 200-PW-4 General Process Condensate Group Operable Units* (RI Report), Appendix B, and are discussed in this plan (Chapter 7.0).

The proposed strategy for the 216-A-36B Crib TSD unit is clean closure (Chapter 6.0). This strategy is based on analytical data obtained during the 200-PW-2/-4 OU remedial investigation and on process knowledge and waste characteristics information. The data and information demonstrate that TSD unit vadose zone soil meets clean-closure performance standards with regard to TSD unit constituents, without further physical closure activities. The data also show that TSD unit operations and TSD unit constituents did not impact groundwater, so that groundwater contamination does not preclude TSD unit clean closure. Consequently, a final-status RCRA groundwater monitoring plan will not be required for monitoring the TSD unit constituents. Because the clean-closure strategy is based on the results of completed sampling and analysis and process information described in this plan, approval of this plan will constitute approval of TSD unit clean closure.

Non-TSD unit constituents will be addressed through the CERCLA past-practice processes identified in the Tri-Party Agreement (Ecology et al. 1989a), Section 7.2, for the consolidated 200-PW-2 and 200-PW-4 OUs. These activities are outside the scope of TSD unit closure and satisfy RCRA corrective action requirements. Closure of waste transfer piping from the 202-A Plant Canyon Building to the 216-A-36B Crib is outside the TSD unit boundary and the scope of TSD unit closure (Section 2.1).

2.0 FACILITY DESCRIPTION

This chapter describes the 216-A-36B Crib site and provides security information. The information in this chapter summarizes information provided in the RI/FS Work Plan (DOE/RL-2000-60 and the RI Report (DOE/RL-2004-25).

2.1 DESCRIPTION AND HISTORY OF OPERATIONS

The 216-A-36B Crib is located in the 200 East Area about 366 m (1,200 ft) south of the 202-A Plant Canyon Building (PUREX Plant) (Figure 1). This crib is an engineered, subsurface liquid-effluent disposal facility that received PUREX ASD waste from 1966 until October 1972, when the crib temporarily was removed from service. The crib was placed back in service in November 1982 for the restart of the PUREX Plant and operated again until September 6, 1987, when the unit received its final volume of waste. The 216-A-36B Crib is the southern 152 m (500 ft) of the original 216-A-36 Crib. In 1966, the 216-A-36 Crib was reconfigured into two segments, 216-A-36A, and 216-A-36B, by the injection of grout into the gravel layer of the crib to form a barrier between the two segments. The crib was reconfigured because of the rapid buildup of fission products in the A segment from what were then routine effluent releases. A smaller diameter pipeline was inserted inside the original 216-A-36A pipeline, effectively moving the discharge point 3.65 m (12 ft) south of the grout barrier and bypassing the 'A' segment.

The gravel-filled 216-A-36B Crib is 152 m (500 ft) long and 3.4 m (11 ft) wide at the bottom. The bottom of the crib is 7.3 m (24 ft) below grade. A 15 cm (6 in.) diameter perforated stainless steel pipe was placed horizontally 7 m (23 ft) below grade. The crib has been backfilled with 7 m (23 ft) of clean soil and naturally revegetated over time with native grasses, although a program of herbicide treatments has controlled deep rooting plants. Figure 2 is a configuration diagram of the 216-A-36B Crib (showing both the 'A' and 'B' segments).

Other associated crib structures include a liquid-level monitoring riser (i.e., a gage well) and a vent riser. The gage well is constructed of 20 cm (8-in.) vitreous clay pipe extending from the bottom of the crib to about 1 m (3.5 ft) above grade. The lower portion of the gage well is perforated to allow monitoring of the depth of liquid in the crib. The vent riser is a 20 cm (8-in.) code M-8 stainless steel pipe attached to the end of the distribution line. The vent riser contains an internal tube filter and extends approximately 0.92 m (3 ft) above grade.

The unit-specific Part A (DOE/RL-88-21) identifies the TSD unit boundary as beginning inside the security fence surrounding the crib. Under WAC 173-303-040, "Definitions," for 'landfill,' this unit has no ancillary piping. The waste feed piping from the 202-A Plant Canyon Building to the 216-A-36B Crib is outside the TSD unit boundary and the scope of TSD unit closure.

Figure 1. 216-A-36B Crib Site Plan.

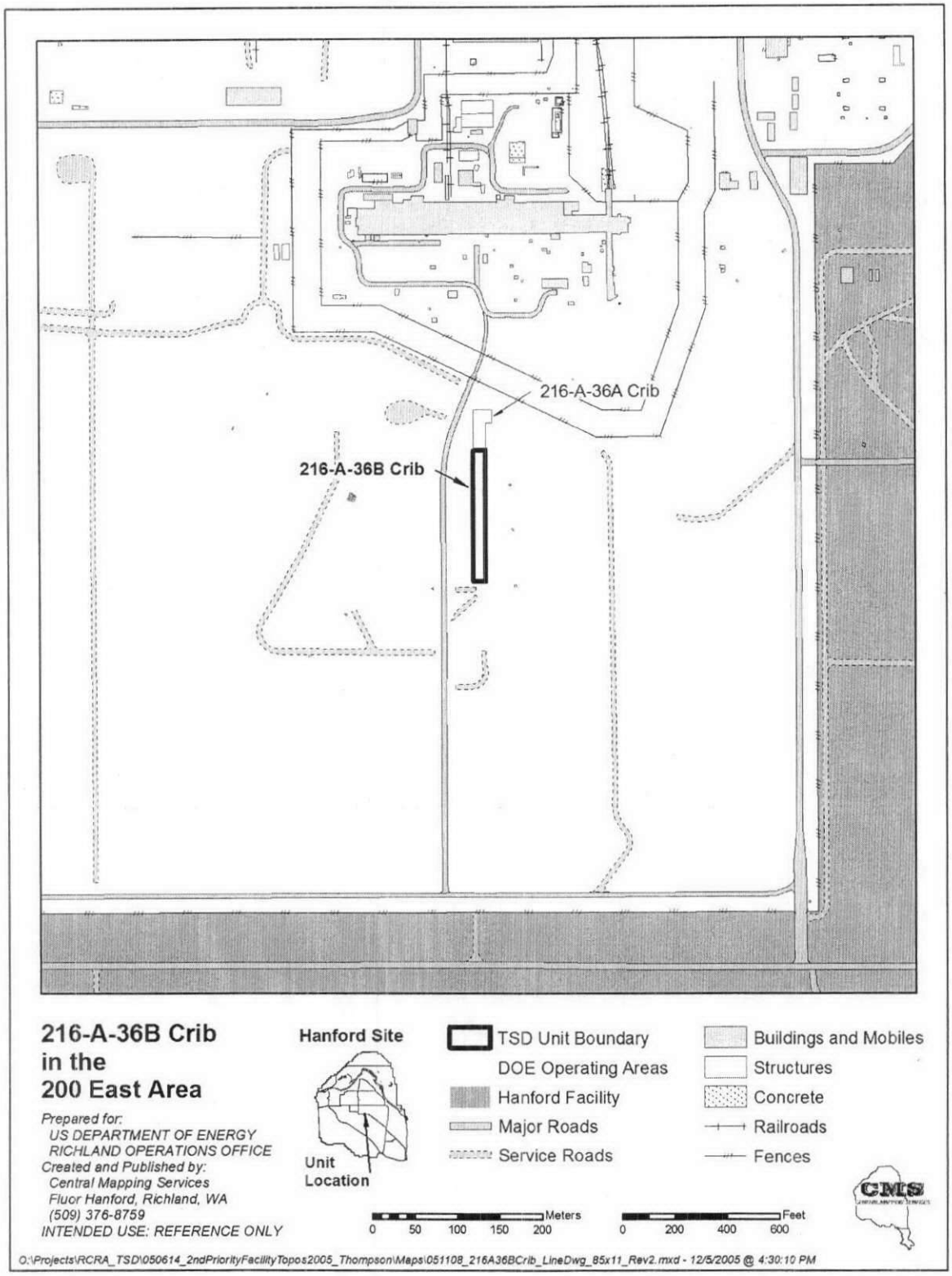
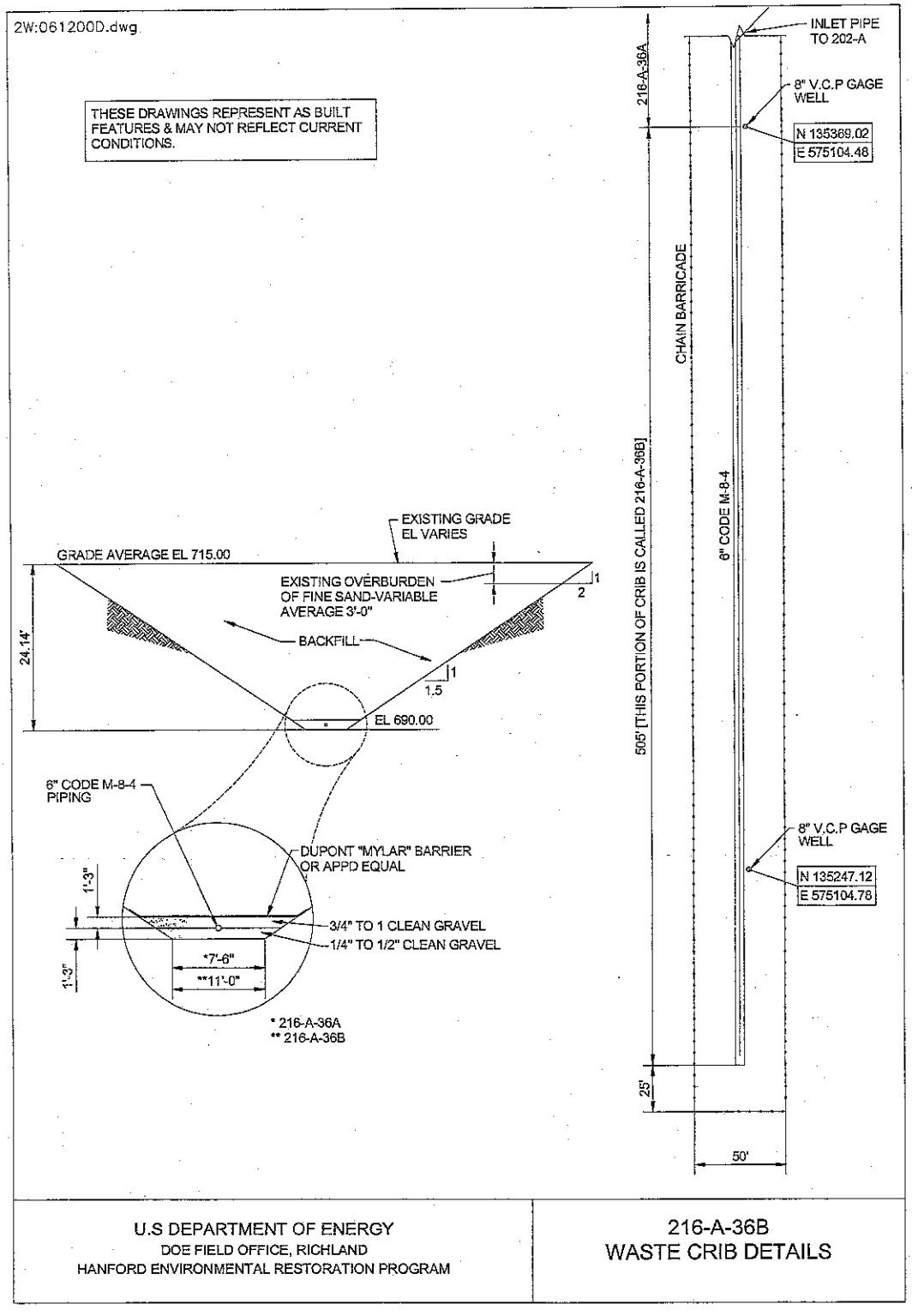


Figure 2. Construction Diagram for the 216-A-36B Crib.



With the exception of a large-volume discharge of highly radioactive cladding removal waste (CRW), this site received only ASD waste. Although the crib entered operations in 1966, it operated as a TSD unit for less than one month (i.e., from August 19, 1987, the effective date of RCRA regulation of mixed waste, until September 6, 1987, when the unit received its final volume of waste). The final waste discharge was September 6, 1987. Because routine discharges to the crib stopped after designation of the ASD waste stream as a potentially dangerous waste, it is likely that the September 6, 1987, discharge was the sole ASD waste discharge during the period of TSD unit operations. After this time, ASD waste from the Concentrator was permanently rerouted to the Double-Shell Tank System. The crib has remained out of service. The crib surface backfill material is not contaminated (Section 7.2.2.3). No stabilization actions have been required at the waste site.

2.2 SECURITY INFORMATION

Security information for the Hanford Facility is discussed in DOE/RL-91-28, *Hanford Facility Dangerous Waste Permit Application*, Section 6.1.

A chain barrier surrounds the 216-A-36B Crib. Changes to security are expected to occur during the course of 200 East Area deactivation and decommissioning activities. The chain barrier will remain in place until closure of the TSD unit is approved.

3.0 PROCESS INFORMATION

This chapter identifies the process that was the source of the waste disposed of at the 216-A-36B Crib (including a significant pre-RCRA operational event) and the crib disposal process.

3.1 WASTE SOURCES AND DESCRIPTION

During the entire period of 216-A-36B Crib operations (beginning in 1966), the site generally received only PUREX ASD waste generated during N Reactor spent-fuel dissolution (decladding) operations in the 202-A Plant Canyon Building. Spent-fuel dissolution occurred in dissolvers in a solution of concentrated ammonium fluoride and ammonium nitrate (AFAN). This process produced highly contaminated CRW and, secondarily, large quantities of gaseous ammonia, which was scrubbed with water to prevent its release to the atmosphere. Before 1970, ammonia scrubber waste underwent less processing before it was discharged than it did during TSD unit operations, and it contained higher levels of contaminants. During the period of RCRA operations, dissolver condensate and scrubber liquid called ammonia scrubber feed was collected in Catch Tank F12 and pumped to the E-F11 Concentrator for boiling to further concentrate radionuclides. This process generated ammonia scrubber waste with reduced radiological and AFAN solution chemical constituents. All of the ammonia from the E-F11 Concentrator was volatilized during boiling and was reabsorbed in an overhead condenser, forming a condensate waste stream containing liquid ammonium hydroxide, identified as ASD. As the result of two condensation steps, ASD waste primarily was water that was low in solids and contained ammonium hydroxide and small quantities of low-level radionuclides. Ammonium hydroxide was the primary constituent of concern in ASD waste, which sometimes contained much smaller quantities of ammonium fluoride.

In May 1970, before fuel decladding-process modifications were initiated (including addition of the E-F11 Concentrator), to reduce contaminant discharges, a substantial discharge of CRW occurred to this crib (*Waste Information Data System* database; Malody, 1970, "Radionuclide Release to A36-B Crib"). This discharge is documented to have potentially released up to 1,589,868 L (420,000 gal) of CRW waste containing extensive quantities of nitrate and fission products. The CRW originated from the fuel dissolver tanks at the head end of the fuel dissolution process and was a concentrated AFAN solution. This quantity of concentrated nitrate-bearing waste constituted a substantial direct discharge of nitrates to the crib soil column. This discharge is the sole documented direct discharge of nitrates to the crib. However, before fuel dissolution process modifications were made (after 1970), the potential existed for other, similar, discharges to have occurred (*Waste Information Data System* database; Malody, 1970).

3.2 TREATMENT, STORAGE, AND DISPOSAL UNIT DISPOSAL PROCESS

The 216-A-36B Crib operated as a landfill for disposal of liquid PUREX ASD waste received via the 202-A Plant Canyon Building E-F11 Concentrator condensers. Waste was jetted to the

crib from the condensers through waste transfer piping, bypassing the north end (216-A-36A Crib), and discharging through perforated, distribution piping to the soil column of the 216-A-36B Crib. No waste treatment occurred at this site.

4.0 WASTE CHARACTERISTICS

This chapter identifies the inventory and the characteristics of the waste treated and stored at the 216-A-36B Crib during the period of TSD unit operations.

4.1 WASTE INVENTORY

During the period of TSD unit operations, this crib generally received only ASD waste. Discharges to the crib ceased in September 1987. The process design capacity was 440,000 L (160,000 gal) per day. During the entire period of crib operations (before and during RCRA operations), approximately 377,011 m^3 of ASD waste effluent are estimated to have been discharged (DOE/RL-98-28, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program*). However, because the TSD unit operated for less than 3 weeks (Section 3.1) and potentially received only one discharge of ASD waste, TSD unit operations account for only an inconsequential portion of the overall waste discharged to this crib since 1966.

4.2 WASTE CHARACTERISTICS

During the period of TSD unit operations, the ASD waste managed as this unit was a mixed waste that primarily was water containing ammonium hydroxide and small quantities of low-level radionuclides. ASD waste was the result of two sequential condensation steps and contained very little in the way of solids. Other waste streams are not documented to have been discharged to the crib during RCRA operations. The ASD waste contained ammonia (WT02, state-only, toxic waste) in the ammonium hydroxide that could, on occasion, have exceeded 1 wt%. The Part A (DOE/RL-88-21) identifies liquid ammonium hydroxide as the only dangerous waste compound potentially managed at this unit (Table 1), and the ammonia in the ammonium hydroxide represents the sole potential TSD unit constituent in waste remaining in the TSD unit soil. Nitrates and nitrites reported in deeper vadose zone soils (Section 7.2.2.3) were not constituents of ASD waste, were not directly discharged to this crib during the short period of TSD unit operations, and are likely the result of past-practice operations and process upsets (Section 6.2.2). Consequently, nitrate and nitrite are not TSD unit constituents and will be addressed outside the scope of TSD unit closure.

Table 1. Comparison of 216-A-36B Crib Treatment, Storage, and Disposal Unit Constituent Soil Concentrations to Clean-Closure Levels.

Treatment, Storage, and Disposal Unit Constituents	Maximum Concentration			Hanford Site Soil Background (mg/kg) [a]	Dangerous Waste Designation (mg/kg)	Closure Levels				Clean Closure Requirement [e]	Meet Clean Closure Standard?
	All Soils		Shallow (<15 ft bgs)			Soil Cleanup Level for Human Health Direct Contact [b]		Groundwater Protection [c] (mg/kg)	Ecological [d]		
	mg/kg	ft bgs				Carcinogen	Noncarcinogen				
Ammonia [f]	58.2	53.5	1.5	9.23	10,000 [g]	NA	NA	NA	NA	NA	Yes

[a] DOE/RL-92-24, Vol. 1, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, 90% lognormal distribution.

[b] WAC 173-340-740(3)(b)(iii)(B), "Unrestricted Land Use Soil Cleanup Standards," "Method B Soil Cleanup Levels for Unrestricted Land Use," "Standard Method B Soil Cleanup Levels," "Human Health Protection," "Soil Direct Contact," equations found in Tables 740-1 (carcinogens) and 740-2 (noncarcinogens) for human-health direct contact. Point of compliance is 15 ft (WAC 173-340-740(6), "Unrestricted Land Use Soil Cleanup Standards," "Point of Compliance."

[c] WAC 173-340-740(3)(b)(iii)(A) directs establishment of soil cleanup levels protective of groundwater, using methods described in WAC 173-340-747, "Deriving Soil Concentrations for Ground Water Protection." Values are calculated using the WAC 173-340-740, "Unrestricted Land Use Soil Cleanup Standards," three-phase model for protection of drinking water (WAC 173-340-747[4], "Deriving Soil Concentrations for Ground Water Protection," "Fixed Parameter Three-Phase Partitioning Model," amended February 12, 2001). Point of compliance is soils throughout the site [WAC 173-340-740(6)].

[d] Ecological considerations are not applicable to treatment, storage, and disposal unit closure (Section 6.2.2).

[e] Listed values represent the most restrictive level of the direct exposure and groundwater protection pathways after evaluation of this value to ensure that it is not less than natural background and for analytical considerations as indicated in WAC 173-340-700(6)(d), "Overview of Cleanup Standards," "Requirements for Setting Cleanup Levels," "Natural Background and Analytical Considerations."

[f] Ammonia not regulated under WAC 173-340, "Model Toxics Control Act -- Cleanup," and no human-health direct-contact soil cleanup level exists.

[g] Designation level for ammonia as a state-only toxicity criteria waste is 1 wt% (10,000 mg/kg) of a waste stream (WAC 173-303-100, "Dangerous Waste Criteria").

bgs = below ground surface.
NA = not applicable.

5.0 216-A-36B CRIB RCRA SITE GROUNDWATER MONITORING

This chapter describes the 216-A-36B Crib groundwater monitoring history and provides aquifer information, groundwater well information, and well sampling and analysis information. This chapter updates information provided in the RI/FS Work Plan (DOE/RL-2000-60) and the RI Report (DOE/RL-2004-25) with the latest (fiscal year 2004) groundwater monitoring results. Information pertaining to non-TSD unit constituents is provided for information only.

After clean closure, no final status groundwater monitoring program will be required for this TSD unit. However, regional monitoring will continue for the PUREX cribs by the 200-PO-1 Groundwater OU for contaminants of concern related to groundwater. Groundwater is scheduled to be remediated under the CERCLA remedial investigation/feasibility study (RI/FS) process for the 200-PO-1 Groundwater OU and groundwater remediation is outside the scope of this closure plan.

5.1 HISTORY OF RCRA GROUNDWATER MONITORING AT THE 216-A-36B CRIB

The 216-A-36B Crib is an engineered, subsurface liquid-effluent disposal facility that received PUREX ASD waste and, as such, is a regulated unit (e.g., surface impoundment, waste pile, land treatment unit, landfill) under the definitions of WAC 173-303-040. Such units must meet interim status groundwater requirements contained in WAC 173-303-400(3)(a) through (3)(c), "Interim Status Facility Standards," "Standards," incorporating by reference 40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Subpart F, "Ground-Water Monitoring," (as implemented by Ecology). The objective of RCRA monitoring for this and the other PUREX cribs is to assess the nature and extent of groundwater contamination with hazardous contaminants and determine their rate of movement in the aquifer (40 CFR 265.93(d), "Preparation, Evaluation, and Response," as referenced by WAC 173-303-400, "Interim Status Facility Standards").

The 216-A-36B Crib is one of three RCRA PUREX cribs that include the 216-A-10 and 216-A-37-1 Cribs. These cribs are located in the southeast part of the 200 East Area within the 200-PO-1 Groundwater OU as designated in the Tri-Party Agreement (Ecology et al. 1989a). These cribs received similar constituents and are located in a region having tritium, nitrate, and I-129 groundwater contamination plumes that exceed drinking water standards. The 200-PO-1 Groundwater OU boundary generally is defined as the extent of the region's tritium plume. A groundwater monitoring program has been in operation for the 216-A-36B Crib since May 1988, in accordance with ongoing RCRA monitoring requirements. The groundwater in the vicinity of the PUREX cribs is monitored on a regional basis. Because determining the contributions of the individual cribs to the groundwater plumes is difficult, monitoring requirements and results for these cribs are reported together (PNNL-15070, *Hanford Site Groundwater Monitoring for Fiscal Year 2004*).

5.2 AQUIFER IDENTIFICATION

The uppermost or unconfined aquifer near the PUREX cribs occurs within Ringold Formation unit A. Depth to water is approximately 100 m (328 ft), and the aquifer is approximately 22 m (72 ft) thick. Flow direction of the unconfined aquifer near the 216-A-36B Crib occurs primarily toward the southeast. However, to the west and northwest, the water table is essentially flat. Groundwater flow velocities beneath the cribs range between 0.003 and 0.48 m/day (PNNL-13788, *Hanford Site Groundwater Monitoring for Fiscal Year 2001*).

5.3 WELL LOCATION AND MONITORING SYSTEM DESIGN

The sites in the 200-PO-1 Groundwater OU are monitored as one waste management unit, because they have similar hydrology and waste constituents. The current interim status groundwater monitoring is identified in PNNL-11523, *Combination RCRA Groundwater Monitoring Plan for the 216-A-10, 216-A-36B, and 216-A-37-1 PUREX Cribs*), which contains details regarding the geology, hydrology, and current groundwater monitoring program for the 216-A-36B Crib.

PNNL-11523 organized the downgradient wells into two groups, near-field wells and far-field wells, most of which are located between the 200 East Area and the Columbia River. Eleven near-field wells and 79 far-field wells coincide with the same wells used for monitoring major tritium, nitrate, and I-129 plumes that extend southeastward of the PUREX cribs area to the Columbia River.

Groundwater monitoring wells and boreholes near the 216-A-36B Crib are shown in Figure 3. Wells 299-E17-14, 299-E17-18, and 299-17-16 are the near-field downgradient monitoring wells for the 216-A-36B Crib. Wells 299-E17-16 and 299-E17-18 are sampled semiannually, and well 299-E17-14 is sampled quarterly. Well 299-E24-18 serves as the near-field upgradient monitoring well for the 216-A-36B Crib and is sampled semiannually. PNNL-11523 contains as-built drawings of the 11 near-field wells and schematic diagrams of the far-field wells.

5.4 WELL SAMPLING AND ANALYSIS

The PUREX cribs have been sampled for contaminant indicator parameters, groundwater quality parameters, drinking water parameters, and site-specific parameters to satisfy RCRA groundwater monitoring program requirements. The near-field well parameters include anions (nitrate, sulfate, chloride, ammonia); filtered, inductively coupled plasma metals; and the field-collected parameters of pH, specific conductance, temperature, turbidity, and water level. The far-field well parameters include anions and the same field-collected parameters as the near-field wells. Table 2 identifies the concentration in groundwater of ammonia, the sole TSD unit constituent that is a groundwater parameter measured in wells monitoring the crib.

Figure 3. Borehole and Groundwater Monitoring Well Locations for the 216-A-36B Crib.

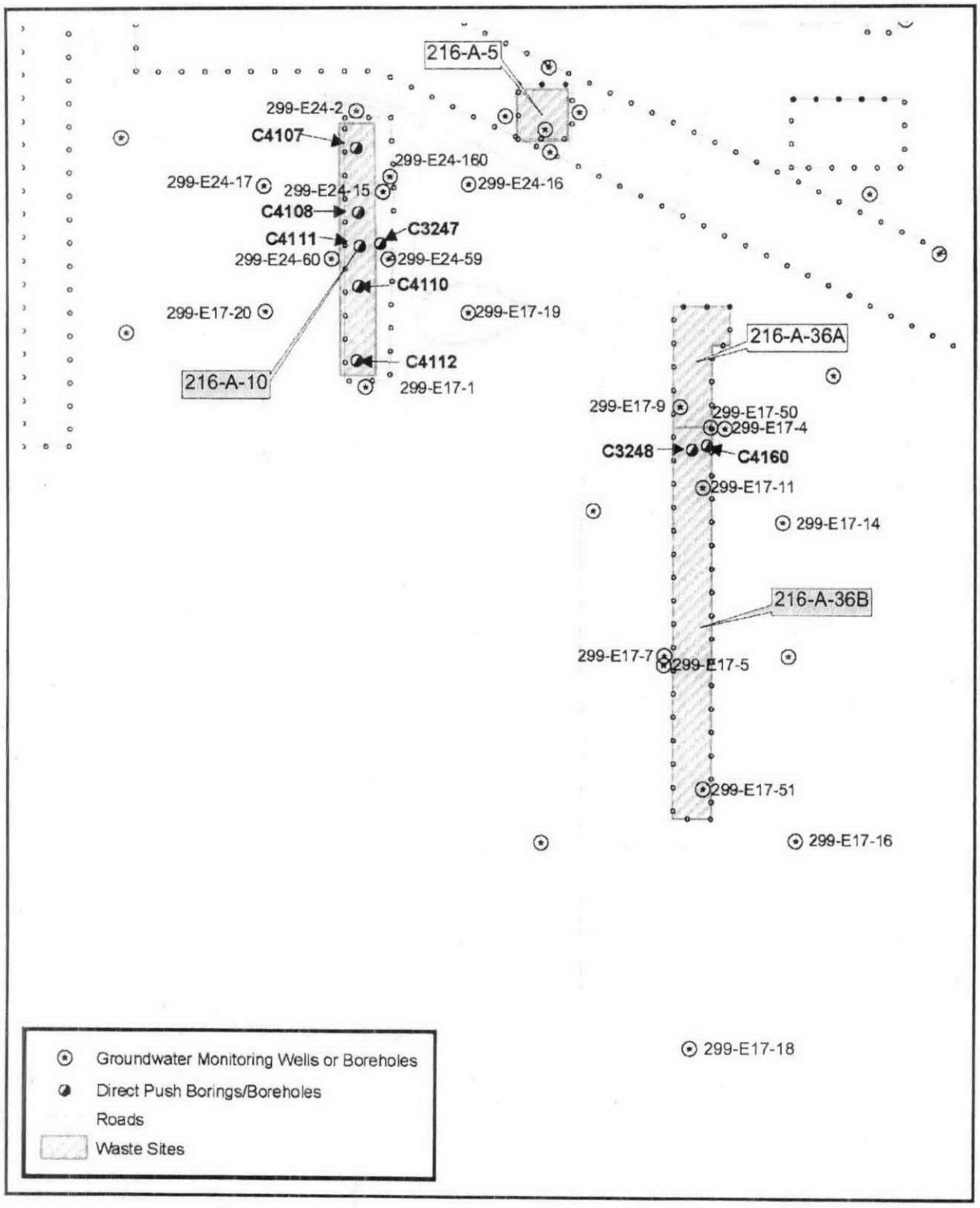


Table 2 Comparison of 216-A-36B Crib Groundwater Data to Clean-Closure Levels.

Treatment, Storage, and Disposal Unit Constituent	Maximum Concentration in Groundwater (µg/L)	Hanford Site Groundwater Background (µg/L) [a] (90% Log Normal Distribution)	Overall Groundwater Cleanup Level (µg/L)	Clean Closure Driver [b]	Meet Clean Closure Standard?
Ammonia	7.05U	113	NA	Not regulated	Yes

[a] DOE/RL-96-61, *Hanford Site Background: Part 3, Groundwater Background.*

[b] Listed values represent the most restrictive level of the groundwater pathways after evaluation of this value, to ensure that it is not less than natural background and for analytical considerations as indicated in WAC 173-340-700(6)(d), "Overview of Cleanup Standards," "Requirements for Setting Cleanup Levels," "Natural Background and Analytical Considerations."

NA = not applicable.

5.5 RESULTS OF INTERIM STATUS GROUNDWATER ASSESSMENT

The most current (fiscal year 2004) groundwater monitoring results are presented in PNNL-15070. Semiannual statistical evaluations have not directly shown that groundwater quality has been impacted from waste discharged into the 216-A-36B Crib. Monitoring results (including process knowledge and discharge records) indicate that the impact to groundwater also originates from other facilities as well as from the216-A-10, 216-A-36B, and 216-A-37-1 Cribs. The 216-A-36B Crib historically affected groundwater by producing an elevated water table (effluent volume 318,080 m^3). However, further individual constituents known to have originated from the PUREX cribs have been detected in groundwater above the maximum contaminant level (MCL) or drinking water standards.

PNNL-15070 provides the results of current groundwater monitoring. The sole TSD unit constituent, ammonia (i.e., ammonium ion) in ammonium hydroxide has no Federal drinking water standard (MCL). PNNL-15070 identified other constituents (e.g., nitrate (as N) and tritium) as exceeding the groundwater protection standards/guidelines in the vicinity of the crib. The nitrate contamination plume in this region generally is attenuating throughout the majority of its extent, except in the area of the RCRA PUREX cribs. The maximum nitrate concentration detected near the PUREX Plant in fiscal year 2002 was 52.6 mg/L in well 299-E17-9, located in the 216-A-36A Crib (adjoining the 216-A-36B Crib) (PNNL-14187, *Hanford Site Groundwater Monitoring for Fiscal Year 2002*). The maximum nitrate concentration in groundwater in 2004 was 132 mg/L at near-field monitoring well 299-E17-14 (PNNL-15070). Although the extent of the nitrate plume emanating from the 200 East Area is nearly identical to that of the tritium plume, the area of the nitrate that is greater than the MCL (45 mg/L) is considerably smaller than the portion of the tritium plume above the tritium drinking water standard (20,000 pCi/L).

5.6 TREATMENT, STORAGE, AND DISPOSAL UNIT GROUNDWATER IMPACT SUMMARY

Monitoring of the groundwater indicates that impact to groundwater also occurs from facilities outside the 200-PW-2 and 200-PW-4 OUs. However, previous to operations as a TSD unit, the 216-A-36B Crib (and the other PUREX Cribs) likely impacted groundwater by contribution of non-TSD unit constituents (e.g., nitrates, radionuclides). In recent years, the concentration of nitrate in RCRA PUREX cribs near-field wells either has held steady or has risen. This could related to vadose zone inventory that continues to migrate to the saturated zone or to changes in groundwater flow paths caused by the decreased amount of groundwater flow from B Pond and a greater contribution of groundwater flow from the northwest. The nitrate reported in groundwater likely is from past-practice routine or occasional (Section 3.2) direct discharges of nitrate-bearing compounds to the PUREX cribs (e.g., ammonium nitrate and CRW to the 216-A-36A and 216-A-36B Cribs and nitric acid waste to the 216-A-10 Crib).

The 216-A-36B Crib RCRA TSD unit was an inconsequential contributor of low contaminant ASD waste and during the period of TSD unit operations reasonably did not impact groundwater. The RCRA TSD unit received only ASD waste, with ammonia as the only TSD unit chemical

constituent. The TSD unit operated for three weeks, at most, in 1987, with potentially only a single discharge. Ammonia is not currently in groundwater above any Federal standard and is in soil at concentrations well below levels that reasonably could impact groundwater in the future.

6.0 CLOSURE STRATEGY AND PERFORMANCE STANDARDS

This chapter identifies the 216-A-36B Crib closure strategy and closure performance standards.

6.1 CLOSURE STRATEGY

The 216-A-36B Crib soils and crib piping and materials will be clean closed without further physical closure actions. In 2004, TSD unit characterization sampling was completed as a portion of the 200-PW-2/-4 OU CERCLA RI/FS process. The results of the 200-PW-2/ 200-PW-4 remedial investigation sampling and analysis, as identified in the following sections, indicate that no dangerous waste constituent disposed of during the period of TSD unit operations (TSD unit constituents) exists in crib soils above analytical clean-closure standard(s) established in accordance with WAC 173-303-610(2)(b)(i) and (ii), "Closure and Post-Closure," "Closure Performance Standard." Because the clean-closure approach is based on the results of completed sampling and analysis and the clean-closure justification discussion presented in this plan, approval of the plan will constitute approval of clean closure. Any further physical activities necessary to complete waste site disposition of non-TSD unit constituents (e.g., radionuclides and past-practice chemical constituents) will occur in conjunction with 200-PW-2/ 200-PW-4 OU activities under the Tri-Party Agreement (Ecology et al. 1989a), Chapter 7.0, past-practice processes that are outside the scope of TSD unit closure and that satisfy RCRA corrective action requirements under the WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8, for the Treatment, Storage, and Disposal of Dangerous Waste*, Condition II.Y.

The 216-A-36B Crib RCRA TSD unit is not responsible for contaminants in groundwater (Chapter 5.0), and their presence in groundwater above drinking water standards does not preclude TSD unit clean closure before completion of groundwater cleanup. After clean closure, this crib will continue to be monitored by the 200-PW-1 Groundwater OU under a RCRA groundwater assessment program for past-practice (corrective action) constituents after TSD unit closure.

6.2 CLOSURE PERFORMANCE STANDARDS

This section identifies TSD unit closure performance standards and clean-closure requirements with regard to TSD unit constituents.

6.2.1 Treatment, Storage, and Disposal Unit Performance Standards

The standards for closure of this TSD unit are in accordance with the requirements of *Hanford Federal Facility Agreement and Consent Order Action Plan* (Ecology et al. 1989b), Section 5.3, directing that closure of Hanford Site interim status TSD units meet cleanup requirements established in accordance with WAC 173-303-610, "Closure and Post-Closure." As required by Tri-Party Agreement, Section 6.3.1, clean closure for disposal units also must demonstrate that

TSD unit operations did not adversely impact soil or groundwater. The closure performance standards of WAC 173-303-610(2)(a)(i - iii) require the owner or operator of a TSD facility to close the facility in a manner that (1) minimizes the need for further maintenance; (2) controls, minimizes, or eliminates, postclosure escape of dangerous waste, dangerous waste constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere to the extent necessary to protect human health and the environment; and, (3) returns the land to the appearance and use of surrounding land areas.

Clean closure, meaning the status of a Hanford Site TSD unit closed to levels prescribed in WAC 173-303-610(2)(b), will meet these performance standards. Clean closure will eliminate the need for future inspections, monitoring, and maintenance resulting from contamination from TSD unit constituents. Clean closure will eliminate the need for future postclosure monitoring and maintenance. Clean closure based on completed sampling and analysis demonstrates the absence of contamination from TSD unit constituents at the 216-A-36B Crib that could escape after closure, thereby eliminating the need for postclosure maintenance or monitoring. After clean closure, the appearance of the land will be consistent with future land-use determinations for adjacent portions of the 200 Areas as an industrial-exclusive portion of the Hanford Site.

6.2.2 Clean Closure Standards for Soil

The clean-closure standards for soil are action levels established to meet the closure performance standards of WAC 173-303-610(2)(a) and the clean-closure requirements of WAC 173-303-610(2)(b)(i) and WAC 173-303-665(6), "Landfills," "Closure and Post-Closure Care." The soil qualifies for clean closure, because no TSD unit constituents have been shown by remedial investigation sampling to exceed soil cleanup levels prescribed by WAC 173-303-610(2)(b)(i). In accordance with WAC 173-303-610(2)(b)(i), clean closure levels for TSD unit constituents in soils are numeric levels calculated using the formulas of WAC 173-340-740(3) "Unrestricted Land Use Soil Cleanup Standards," "Method B Soil Cleanup Levels for Unrestricted Land Use," or Hanford Site background (DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*) concentrations, whichever is least restrictive. However, at this unit, the sole dangerous waste constituent of concern, WT02 ammonia from the ammonium hydroxide, is not regulated under WAC 173-340 and no regulatory cleanup level exists. In addition, no treatment standard exists for state only (WT02) ammonia wastes. Given the absence of an established regulatory cleanup level for ammonia in soil, the clean-closure requirement will be the dangerous-waste designation level for ammonia as a state-only toxicity criteria (WT02) waste, calculated in accordance with WAC 173-303-100, "Dangerous Waste Criteria" (i.e., greater than 1 wt% of the waste stream). Because there is no regulatory level and because the ammonia reported in soil [i.e., ranging from 21.9 mg/kg at 7.6 m (25 ft) below ground surface (bgs) to 58.2 mg/kg at 16.3 m (53.5 ft)] is not sufficient to designate soil (if removed) as a state-only WT02 dangerous waste, this TSD unit meets WAC 173-303-610 clean-closure cleanup requirements without further remediation.

Nitrate and nitrite (both as N) were reported in deep crib soils at concentrations that exceed WAC 173-340-747, "Deriving Soil Concentrations for Ground Water Protection," soil concentrations protective of groundwater. However, these were not constituents of ASD waste and were not listed on the Part A (DOE/RL-88-21) as being received during the period of

TSD unit operations, and so are not considered TSD unit constituents. The following potential sources of nitrates and nitrites were considered in making this determination: ASD waste, oxidation of ammonium compounds in soil after disposal, natural background, and/or past-practice releases of nitrate-bearing (non-ASD) waste. Because only trace quantities of nitrates were known to exist as inorganic anions in the ASD waste, soil concentrations likely are not from this source. Some portion of the ammonia in ammonium hydroxide (the only nitrogen-based compound associated with ASD waste) could have oxidized to nitrate in the environment under limited aerobic conditions requiring exposure to air. However, this oxidation is not anticipated to have occurred in the deep, anaerobic soils of this crib. Even if oxidation did occur in some limited capacity, the short duration of TSD unit operations greatly limited the ammonia discharged during TSD unit operations and, therefore, the quantity of ammonia available for conversion to nitrate as a result of TSD unit operations. Natural background levels can range from 52 to 232 mg/kg (DOE/RL 92-24, Table 2), and the maximum nitrate concentration of 289 mg/kg is only slightly above the 95 percent upper confidence limit background value of 232 mg/kg. The documented past-practice discharge of approximately 1,589,868 L (420,000 gal) of CRW to this crib and the potential for similar undocumented past-practice discharges (Section 3.1), represent substantial quantities of nitrates discharged directly to crib soil. Therefore, direct past-practice discharge(s) and potentially high natural background concentrations reasonably account for the elevated nitrate levels in crib soils.

Although not a TSD unit dangerous waste constituent, nitrate meets the definition of a hazardous substance under the cleanup provisions of the Tri-Party Agreement (Ecology et al. 1989a) (CERCLA or RCRA corrective-action provisions). Currently, nitrate exceedances would be dispositioned under the 200-PW-4 OU CERCLA RI/FS process that is outside the scope of TSD unit closure and that will satisfy RCRA corrective action requirements. Ecology will oversee nitrates as past practice constituents at the clean closed TSD unit under RCRA corrective-action authority, under the WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit, Dangerous Waste Portion, Revision 8, for the Treatment, Storage, and Disposal of Dangerous Waste*, Condition II.Y.

Along with human health protection requirements with regard to TSD unit constituents, cleanup to WAC 173-340-740(3), "Unrestricted Land Use Soil Cleanup Standards," "Method B Soil Cleanup Levels for Unrestricted Land Use," identifies requirements for consideration of ecological protection (WAC 173-340-740(3)(b)(ii)), soil-vapor ambient-air contamination control (WAC 173-340-740(3)(b)(iii)(C)), and groundwater protection requirements (WAC 173-340-740(3)(b)(iii)(A)). However, these requirements are not applicable to this TSD unit closure. Soil vapor ambient-air protection requirements for protection from exposure to volatile organic constituent vapors do not apply because volatile organic constituents were not detected in site soils. Ecological protection requirements do not apply based on WAC 173-340-7493(2)(a)(i), "Site-Specific Terrestrial Ecological Evaluation Procedures," "Problem Formulation Step," "The Chemicals of Ecological Concern," and, beyond that, no ecological indicator soil concentration (WAC 173-340-900, "Tables," Table 749-3) exists for any detected TSD unit constituent. Groundwater protection requires no further consideration, because TSD unit constituents either are not in groundwater above MCLs or, as in the case of ammonia, are monitored but have no MCL (Table 2).

6.2.3 Clean Closure Standard for Piping and Materials

The clean-closure standard for crib construction piping and materials is established in accordance with WAC 173-303-610(2)(ii). This standard is the dangerous waste designation level for ammonia as a state-only, toxicity criteria (WT02) waste calculated in accordance with WAC 173-303-100 (i.e., greater than 1 wt% of the waste stream). Achievement of this standard for these materials will be demonstrated through the use of process knowledge (Chapter 3.0) and knowledge of waste characteristics (Chapter 4.0).

Buried crib construction materials within the TSD unit boundary and the scope of closure (Section 2.1) include stainless steel waste distribution piping and stainless steel vent piping; vitrified clay gage well piping; and the thin-gage plastic sheeting overlaying the distribution piping as a moisture barrier. The waste distribution that accounts for almost all of the crib piping and the moisture barrier are located approximately 7 m (23 ft) bgs. These materials are not reasonably expected to be contaminated with TSD unit constituents above clean-closure levels, and their removal or further analytical investigation will not be necessary for clean closure.

All of the piping is considered to be empty. No liquid has been added for 18 years. Waste distribution piping can only be empty, because liquids cannot remain in a pipe that was designed to readily discharge effluent content by being sloped and perforated. The gage well and vent piping were open ended and were placed vertically in unit soils to provide access for effluent-level measurements; and so they were installed so as not to retain liquids. The plastic membrane was placed at least 38 cm (15 in.) above the piping (perforated to drain directly to gravel below) and contact with waste (if any) would have been only incidental. Because the effluent, primarily water, is very low in solids and has ammonia as the only TSD constituent, residues are not anticipated (slight oxidation film at most). There is no reasonable potential for sufficient ammonia to exist in the empty piping or on piping or the plastic barrier surfaces in the form of effluent or waste residues to reach the WT02 dangerous waste designation level (1 wt% (10,000 mg/kg)).

7.0 CLOSURE ACTIVITIES

This chapter summarizes completed clean-closure activities for the 216-A-36B Crib performed as a portion of the 200-PW-2/-4 OU RI/FS process. Closure activities included TSD unit physical isolation, borehole drilling, and soil sampling and analysis.

7.1 TREATMENT, STORAGE, AND DISPOSAL UNIT PHYSICAL ISOLATION

The following activities already have occurred to preclude any further discharges to the unit and in support of TSD unit closure. The PUREX facility that was the sole source of the waste discharged to this crib has been shut down. In September 1987, ASD waste from the 202-A Plant Canyon Building E-F11 Concentrator condenser that previously had been sent to the crib was rerouted to the Double-Shell Tank System for storage until final disposition. No discharge to the crib has occurred since the final discharge of ASD waste on September 6, 1987.

7.2 TREATMENT, STORAGE, AND DISPOSAL UNIT CLOSURE CHARACTERIZATION

This section identifies the 216-A-36B TSD unit closure characterization activities, comprising borehole drilling, geophysical logging, field screening, and sampling and analysis of borehole soils performed in fiscal years 2003 and 2004. These activities were performed as a portion of the 200-PW-2/-4 OU CERCLA RI/FS process to identify the nature and extent of chemical and radiological contamination in vadose zone soil underlying the crib, in support of OU remedial decision making and RCRA TSD unit closure. The remedial investigation was conducted in accordance with the sampling and analysis Plan in Appendix B of the RI/FS Work Plan (DOE/RL-2000-60, Rev. 1). Data collected from the crib are presented in the RI Report (DOE/RL-2004-25, Appendix B) and described in Section 7.2.2.3.

7.2.1 Borehole Drilling and Geophysical Logging

This section identifies the 216-A-36B Crib borehole drilling and borehole geophysical logging activities during borehole drilling.

7.2.1.1 Borehole Drilling

Boreholes C3248 and C4160 (Figure 3) were drilled for characterization of the 216-A-36B Crib. The borehole activities for this crib are described in detail in CP-18666, *200-PW-2 and 200-PW-4 Operable Unit Borehole Summary Report*. Drilling commenced on Borehole C3248 on July 1, 2003, and met refusal at a depth of 8 m (26 ft) bgs, resulting in abandonment of the attempt and decommissioning of the borehole. Soil samples were taken to a depth of 7.3 m (24 ft) bgs before borehole decommissioning. Borehole C4160 was drilled from the ground surface to the water table at depths of approximately 85 m (278 ft). The drilling of Borehole C4160 began on July 2, 2003, and was completed on September 9, 2003.

Boreholes were drilled to the top of groundwater using a cable-tool drill rig. The borehole was advanced to total depth using drive barrels and split-spoon samplers. Split-spoon samplers were used as the primary sampling device for collecting chemical, radiological, and physical property samples; however, the drive barrel occasionally was used to collect moisture samples. After reaching total depth, each borehole was decommissioned by removing the temporary casings and backfilling the borehole with silica sand from the bottom to the water table, with granular bentonite up to 0.3 to 1 m (1 to 3 ft) bgs, and with a concrete surface seal, in accordance with WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells."

7.2.1.2 Geophysical Logging Activities and Results

Geophysical logging was performed between August 5, 2003, and September 2, 2003, for Borehole C4160 using the Spectral Gamma-Ray Logging System, High Radioactive Logging System, and Neutron Moisture-Logging System. Data and additional details from the 216-A-36B Crib characterization are presented in the borehole summary report (CP-18666, Appendix F) and in the RI Report (DOE/RL-2004-25).

Logging information obtained during borehole installation was used to guide sampling and analysis, for safety considerations, and to help confirm contamination information identified by analytical sampling. The spectral gamma-ray logs supplement analytical radionuclide data and present a vertical distribution of radionuclides in the vadose zone beneath the waste sites. A neutron moisture-logging tool was employed to provide a direct reading of hydrogen atom distribution and to generate a moisture profile of the vadose zone in each borehole, because mobile contaminants move toward groundwater with the moisture front.

Geophysical logging results generally correlate well with analytical data. Logging confirmed maximum contaminant concentrations at 7.6 m (25 ft) bgs (crib bottom), generally decreasing at greater depths, consistent with the conceptual contaminant distribution model for the 216-A-36B Crib (RI/FS Work Plan, DOE/RL-2006-60, Figure 3-16). Moisture logging results confirm physical property sample data from Borehole C4160 that show areas of increased wetness at approximately 87.6 m (289 ft) bgs, 9.1 m (30 ft) above the water table. This correlates with higher concentrations of more mobile radionuclides and chemical constituents (e.g., nitrates) and provides subsurface stratigraphy information suggesting a less porous, clay-like lens at this depth.

7.2.2 Soil Sampling and Analysis

This section describes soil sampling, sample field screening, and sample analytical results.

7.2.2.1 Soil Sampling Activities

Sample collection and analysis were guided by the sample schedule in the RI/FS Work Plan (DOE/RL-2000-60). These activities are described in detail in CP-18666. Analytical data collected from the remedial investigation are presented in the RI Report (DOE/RL-2004-25, Appendix B) and are discussed in the following section.

Thirty-two samples representing Boreholes C3248 and C4160 were sent for chemical and radiological analysis and determination of physical properties. Four of the soil samples were from Borehole C3248 and the remainder were from Borehole C4160. Two were quality control samples (equipment blanks) and the remainder (30) were soil samples obtained from the boreholes from 0.2 to 97.1 m (0.5 to 318.5 ft) bgs.

Borehole soil samples were analyzed for multiple radiological and chemical constituents, including ammonia. Physical property samples were collected at major lithologic changes and as determined by the site geologist. The RI Report (DOE/RL-2004-25), Table 2-2, provides sample information (e.g., *Hanford Environmental Information System* database sample number, date, depth, analyses performed) for all Borehole C3248 and C4160 soil samples.

The crib TSD unit sampling approach generally required a greater sample frequency near the base of each waste site, which usually is the area of highest contamination. Sample collection always was attempted at depths of 4.6 m (or less) and 7.6 m (15 and 25 ft) bgs to define contamination profiles for remedial designs. Samples to a depth of 4.6 m (15 ft) are critical for evaluation of human-health direct exposure and terrestrial wildlife scenarios, whereas deeper samples are applicable to groundwater protection considerations. Sample intervals generally increased below depths of about 15.2 to 27.4 m (50 to 90 ft) to intervals of 15.2 to 30 m (50 to 100 ft). Samples were obtained from the borehole at twelve elevations: 3.8 m (12.5 ft), 7.3 m (24 ft), 7.6 m (25 ft), 8.4 m (27.5 ft), 9.1 m (30 ft), 12.2 m (40 ft), 16.3 m (53.5 ft), 27.3 m (89.5 ft), 60.2 m (197.5 ft), 87.5 m (287 ft), 89 m (292 ft), and 97.1 m (318.5 ft) bgs.
A spilt-spoon sampler was the primary sampling device used to collect the samples from the boreholes. One-liner from selected intervals was analyzed for physical properties.

7.2.2.2 Sample Field Screening

Drill cuttings and soil samples collected from the borehole were screened in the field for volatile organic contamination, ammonia, tributyl phosphate, beta-gamma activity, and alpha activity. Screening information was used to assist with determining discrete sample locations or depths, to support worker health and safety, and for shipping information on the samples being placed into containers for shipment.

Samples were screened using hand-held vapor analyzers for volatile organic contamination, ammonia, and tributyl phosphate. Volatile organic screening was performed with a photoionization detector. Detection of volatile organic compounds above 5 p/M was used as an indicator of contamination. The pH was determined in the field using pH paper, a pH meter, or both. Field screening results were documented in field logbooks.

7.2.2.3 Soil Sample Results

When actively receiving effluent, the crib was about 7.6 m (25 ft) deep (Figure 2). Contamination was not reported in the clean backfill above that level by the sample taken at 3.7 m (12 ft) bgs. As expected at sites receiving ASD waste, ammonia (as N), the sole TSD unit constituent, was reported ranging from 21.9 mg/kg at 7,6 m (25 ft) bgs to 58.2 mg/kg at 16.3 m (53.5 ft). Analytical results are presented in Appendix B of the RI Report (DOE/RL-2004-25). There is no WAC 173-340-740(3) cleanup standard for ammonia. Ammonia concentrations in soil in low milligrams per kilogram did not exceed the

WAC 173-303-100 state-only criteria waste designation level (10,000 mg/kg). Pesticides and herbicides, used to kill vegetation on the surface of the crib, were not detected.

Nitrate (as N) was reported at 289 mg/kg at 16.3 m (53.5 ft) bgs, and the sole nitrite (as N) detection was reported at 18.8 mg/kg at 7.6 m (25 ft) bgs. These concentrations exceed WAC 173-340-747 soil concentrations protective of groundwater for nitrates (40 mg/kg) and for nitrite (4.0 mg/kg). Nitrates only marginally exceeded the range of background levels, and no Hanford Site background exists for nitrite. However, nitrate and nitrite are not 216-A-36B Crib TSD unit constituents and so are outside the scope of TSD unit closure and will be dispositioned by the 200-PW-4 OU CERCLA RI/FS process (Section 6.2.2).

7.2.3 Other Activities During the Closure Period

The duties associated with dangerous waste management activities include performing inspections, notifying Ecology of any potential threats to human health and the environment, and performing groundwater monitoring. Following Ecology clean closure approval, training for dangerous waste management activities at the 216-A-36B Crib will be discontinued.

Until final closure, TSD unit interim status inspections will continue. Following closure plan approval equating to clean-closure approval (Chapter 6.0), inspections for the 216-A-36B Crib will be discontinued.

7.3 SCHEDULE FOR CLOSURE

In accordance with Tri-Party Agreement milestone M-20-033 (Ecology et al. 1989a), submittal of a TSD unit closure plan to Ecology is required by April 30, 2006. The closure plan strategy for this TSD unit is clean closure. Closure activities comprising unit isolation and closure verification sampling and analysis are complete. No additional closure activities have been scheduled. Acceptance of soil sample results and clean-closure justification for crib construction material remaining in place after closure, demonstrating the absence of TSD unit constituent contamination above clean-closure levels, will constitute approval of clean closure and completion of closure.

7.4 AMENDMENT OF CLOSURE PLAN

As required by WAC 173-303-610(3)(b), "Closure and Post-Closure," "Closure Plan; Amendment of Plan," the closure plan will be amended if changes to closure activities require a modification of the approved closure plan. However, closure activities are complete. If, during the closure plan approval process, an amendment to the approved closure plan is required, the DOE will follow the process contained in WAC 173-303-610(3)(b).

7.5 CERTIFICATION OF CLOSURE

This TSD unit received its final volume of waste on September 6, 1987. TSD unit physical closure activities comprising 200-PW-2/-4 OU remedial investigation borehole drilling and soil sampling and analysis were completed in 2004. Ecology acceptance of the remedial investigation sample results and clean-closure justification demonstrating the absence of TSD unit constituent contamination above clean-closure levels will constitute approval of clean closure and completion of closure. In accordance with WAC 173-303-610(6), "Closure and Post-Closure," "Certification of Closure," within 60 days of completion of TSD unit closure, the DOE will submit to the lead regulatory agency (Ecology) a certification of closure. Both DOE and the Co-Operator identified on the current Part A Form (DOE/RL-88-21) will sign the certification of closure, and an independent Registered Professional Engineer will state that the unit has been closed in accordance with the approved closure plan. The certification will be submitted by registered mail or an equivalent delivery service. Documentation supporting the independent Registered Professional Engineer's certification will be placed in the Administrative Record.

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8.0 POSTCLOSURE PLAN

The closure strategy for the 216-A-36B Crib is clean closure with regard to contamination from TSD unit constituents. Therefore, no postclosure plan for purposes of addressing RCRA constituents is needed for this site. Although a RCRA final-status groundwater monitoring program will not be required, corrective action of this site for non-TSD unit constituents in vadose zone soil will continue under the CERCLA RI/FS processes for the 200-PW-2/-4 (source) OU and for non-TSD unit constituents in groundwater under the 200-PO-1 Groundwater OU.

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